

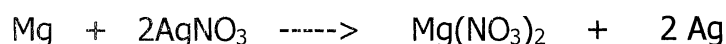
Stoichiometry Problem Worksheet A
Show **ALL** work for stoichiometry problems.

1. How many grams of calcium oxide can be prepared from 50 grams of calcium carbonate?



$$50 \text{ g CaCO}_3 \times \frac{1 \text{ mol CaCO}_3}{100 \text{ g CaCO}_3} \times \frac{1 \text{ mol CaO}}{1 \text{ mol CaCO}_3} \times \frac{56 \text{ g CaO}}{1 \text{ mol CaO}} = 28 \text{ g CaO}$$

2. How many grams of magnesium metal are needed to produce 1.0 gram of silver metal?



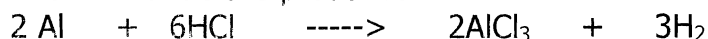
$$1.0 \text{ g Ag} \times \frac{1 \text{ mol Ag}}{108 \text{ g Ag}} \times \frac{1 \text{ mol Mg}}{2 \text{ mol Ag}} \times \frac{24.3 \text{ g Mg}}{1 \text{ mol Mg}} = 0.11 \text{ g Mg}$$

3. If 55 grams of copper react with mercury II nitrate, how many grams of mercury metal are produced?



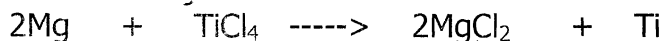
$$55 \text{ g Cu} \times \frac{1 \text{ mol Cu}}{63.5 \text{ g Cu}} \times \frac{1 \text{ mol Hg}}{1 \text{ mol Cu}} \times \frac{201 \text{ g Hg}}{1 \text{ mol Hg}} = 174.1 \text{ g Hg}$$

4. When 65 grams of aluminum metal react with hydrochloric acid, how many grams of aluminum chloride are produced?



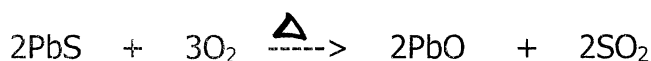
$$65 \text{ g Al} \times \frac{1 \text{ mol Al}}{27 \text{ g Al}} \times \frac{2 \text{ mol AlCl}_3}{2 \text{ mol Al}} \times \frac{133.5 \text{ g AlCl}_3}{1 \text{ mol AlCl}_3} = 321.4 \text{ g AlCl}_3$$

5. How many grams of titanium metal are produced by reacting 15.00 grams of titanium chloride with magnesium?



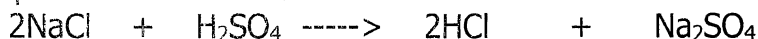
$$15.0 \text{ g TiCl}_4 \times \frac{1 \text{ mol TiCl}_4}{190 \text{ g TiCl}_4} \times \frac{1 \text{ mol Ti}}{1 \text{ mol TiCl}_4} \times \frac{48 \text{ g Ti}}{1 \text{ mol Ti}} = 3.8 \text{ g Ti}$$

6. If 480 grams of lead sulfide are roasted, what mass of sulfur dioxide is produced?



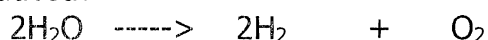
$$480 \text{ g PbS} \times \frac{1 \text{ mol PbS}}{239 \text{ g PbS}} \times \frac{2 \text{ mol SO}_2}{2 \text{ mol PbS}} \times \frac{64 \text{ g SO}_2}{1 \text{ mol SO}_2} = 128.5 \text{ g SO}_2$$

7. What mass of hydrogen chloride is produced when sulfuric acid reacts with 190 grams of pure sodium chloride?



$$190 \text{ g NaCl} \times \frac{1 \text{ mol NaCl}}{58.5 \text{ g NaCl}} \times \frac{2 \text{ mol HCl}}{2 \text{ mol NaCl}} \times \frac{36.5 \text{ g HCl}}{1 \text{ mol HCl}} = 118.5 \text{ g HCl}$$

8. In the decomposition of 144 grams of water by electrolysis, how many liters of oxygen gas are produced?



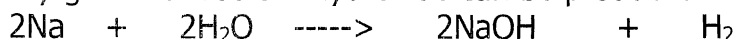
$$144 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18 \text{ g H}_2\text{O}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 89.6 \text{ L O}_2$$

fix → 9. How many liters of oxygen are required to ~~make~~ ^{oxidize} 100 grams of aluminum oxide?



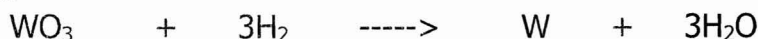
$$100 \text{ g Al}_2\text{O}_3 \times \frac{1 \text{ mol Al}_2\text{O}_3}{102 \text{ g Al}_2\text{O}_3} \times \frac{3 \text{ mol O}_2}{2 \text{ mol Al}_2\text{O}_3} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 32.9 \text{ L O}_2$$

10. If 25 liters of hydrogen are produced by the reaction of sodium metal and water, how many grams of sodium hydroxide can be produced?



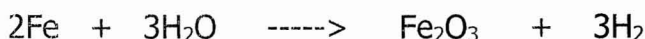
$$25 \text{ L H}_2 \times \frac{1 \text{ mol H}_2}{22.4 \text{ L H}_2} \times \frac{2 \text{ mol NaOH}}{1 \text{ mol H}_2} \times \frac{40 \text{ g NaOH}}{1 \text{ mol NaOH}} = 89.3 \text{ g NaOH}$$

11. Calculate the volume of hydrogen gas needed to reduce 490 grams of tungsten oxide.



$$490\text{g WO}_3 \times \frac{1\text{mol WO}_3}{232\text{g WO}_3} \times \frac{3\text{mol H}_2}{1\text{mol WO}_3} \times \frac{22.4\text{L H}_2}{1\text{mol H}_2} = 141.9\text{L H}_2$$

12. Calculate the mass of iron reacting with steam to produce 7500 liters of hydrogen gas.



$$7500\text{L H}_2 \times \frac{1\text{mol H}_2}{22.4\text{L H}_2} \times \frac{2\text{mol Fe}}{3\text{mol H}_2} \times \frac{56\text{g Fe}}{1\text{mol Fe}} = 12500\text{g Fe}$$

13. How many MOLES of sulfur are needed in the production of 1800 liters of sulfur dioxide? (What's the mole ratio?)



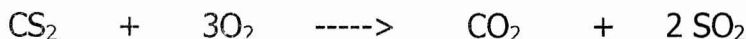
$$1800\text{L SO}_2 \times \frac{1\text{mol SO}_2}{22.4\text{L SO}_2} \times \frac{1\text{mol S}}{1\text{mol SO}_2} = 80.4\text{mol S}$$

14. If 500 grams of calcium carbide react with water, what volume of acetylene gas is produced?



$$500\text{g CaC}_2 \times \frac{1\text{mol CaC}_2}{64\text{g CaC}_2} \times \frac{1\text{mol C}_2\text{H}_2}{1\text{mol CaC}_2} \times \frac{22.4\text{L C}_2\text{H}_2}{1\text{mol C}_2\text{H}_2} = 175\text{L C}_2\text{H}_2$$

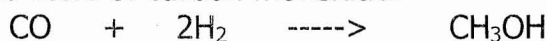
15. If 150 mL of carbon disulfide ($D_{20} = 1.26\text{ g/mL}$) are burned, how many liters of sulfur dioxide are produced? (HINT: use the density as a factor to convert to grams!)



$$\textcircled{B} 189\text{g CS}_2 \times \frac{1\text{mol CS}_2}{76\text{g CS}_2} \times \frac{2\text{mol SO}_2}{1\text{mol CS}_2} \times \frac{22.4\text{L SO}_2}{1\text{mol SO}_2} = 111.4\text{L SO}_2$$

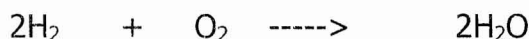
$$\textcircled{A} 150\text{mL} \times \frac{1.26\text{g}}{1\text{mL}} = 189\text{g CS}_2$$

16. In the production of methanol, how many liters of hydrogen are needed to react with 500 liters of carbon monoxide?



$$500 \text{ L CO} \times \frac{1 \text{ mol CO}}{22.4 \text{ L CO}} \times \frac{2 \text{ mol H}_2}{1 \text{ mol CO}} \times \frac{22.4 \text{ L H}_2}{1 \text{ mol H}_2} = 1000 \text{ L H}_2$$

17. To produce water, how many liters of oxygen are needed to react with 600 liters of hydrogen?



$$600 \text{ L H}_2 \times \frac{1 \text{ mol H}_2}{22.4 \text{ L H}_2} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 300 \text{ L O}_2$$

18. If 200 liters of propane are burned, what volume of carbon dioxide is produced?



$$200 \text{ L C}_3\text{H}_8 \times \frac{1 \text{ mol C}_3\text{H}_8}{22.4 \text{ L C}_3\text{H}_8} \times \frac{3 \text{ mol CO}_2}{1 \text{ mol C}_3\text{H}_8} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 660 \text{ L CO}_2$$

19. How many liters of carbon dioxide do oxidizing 500 liters of carbon monoxide gas produce?



$$500 \text{ L CO} \times \frac{1 \text{ mol CO}}{22.4 \text{ L CO}} \times \frac{2 \text{ mol CO}_2}{2 \text{ mol CO}} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 500 \text{ L CO}_2$$

20. How many liters of oxygen are needed to react with sulfur to produce 7000 liters of sulfur dioxide?



$$7000 \text{ L SO}_2 \times \frac{1 \text{ mol SO}_2}{22.4 \text{ L SO}_2} \times \frac{1 \text{ mol O}_2}{1 \text{ mol SO}_2} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 7000 \text{ L SO}_2$$

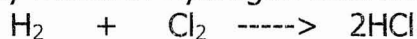
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21. How many grams of sodium bromide are needed to liberate 300 liters of bromine gas from sodium bromide?



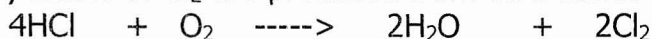
$$300 \text{ L Br}_2 \times \frac{1 \text{ mol Br}_2}{22.4 \text{ L Br}_2} \times \frac{2 \text{ mol NaBr}}{1 \text{ mol Br}_2} \times \frac{103 \text{ g NaBr}}{1 \text{ mol NaBr}} =$$

22. How many moles of hydrogen chloride are needed to form 0.75 moles of Cl_2 ?



$$0.75 \text{ mol Cl}_2 \times \frac{2 \text{ mol HCl}}{1 \text{ mol Cl}_2} = 1.5 \text{ mol HCl}$$

23. How many moles of Cl_2 are produced from 6.75 moles of hydrogen chloride?



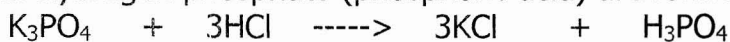
$$6.75 \text{ mol HCl} \times \frac{2 \text{ mol Cl}_2}{4 \text{ mol HCl}} = 3.38 \text{ mol Cl}_2$$

24. How many grams of potassium permanganate are needed to produce 0.76 moles of manganese chloride?



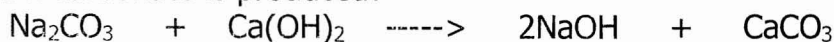
$$0.76 \text{ mol MnCl}_2 \times \frac{2 \text{ mol KMnO}_4}{2 \text{ mol MnCl}_2} \times \frac{158 \text{ g KMnO}_4}{1 \text{ mol KMnO}_4} = 120.1 \text{ g KMnO}_4$$

25. If 120 grams of potassium phosphate react with hydrogen chloride, how many grams of hydrogen phosphate (phosphoric acid) are formed?



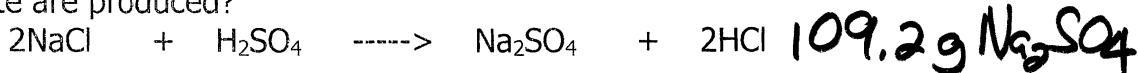
$$120 \text{ g K}_3\text{PO}_4 \times \frac{1 \text{ mol K}_3\text{PO}_4}{212 \text{ g K}_3\text{PO}_4} \times \frac{1 \text{ mol H}_3\text{PO}_4}{1 \text{ mol K}_3\text{PO}_4} \times \frac{98 \text{ g H}_3\text{PO}_4}{1 \text{ mol H}_3\text{PO}_4} = 55.5 \text{ g H}_3\text{PO}_4$$

26. When 80.0 grams of sodium carbonate react with calcium hydroxide, what mass of calcium carbonate is produced?



$$80 \text{ g Na}_2\text{CO}_3 \times \frac{1 \text{ mol Na}_2\text{CO}_3}{106 \text{ g Na}_2\text{CO}_3} \times \frac{1 \text{ mol CaCO}_3}{1 \text{ mol Na}_2\text{CO}_3} \times \frac{100 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3} = 75.5 \text{ g CaCO}_3$$

27. If 90.0 grams of sodium chloride react with sulfuric acid, how many grams of sodium sulfate are produced?



$$90.0 \text{ g NaCl} \times \frac{1 \text{ mol NaCl}}{58.5 \text{ g NaCl}} \times \frac{1 \text{ mol Na}_2\text{SO}_4}{2 \text{ mol NaCl}} \times \frac{142 \text{ g Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} = 109.2 \text{ g Na}_2\text{SO}_4$$

28. If 100.0 grams of barium chloride react with sulfuric acid, how many grams of barium sulfate are produced?



$$100 \text{ g BaCl}_2 \times \frac{1 \text{ mol BaCl}_2}{208 \text{ g BaCl}_2} \times \frac{1 \text{ mol BaSO}_4}{1 \text{ mol BaCl}_2} \times \frac{233 \text{ g BaSO}_4}{1 \text{ mol BaSO}_4} = 112.0 \text{ g BaSO}_4$$

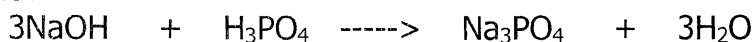
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29. How many grams of oxygen will decomposing 480 grams of potassium chlorate produce?



$$480 \text{ g KClO}_3 \times \frac{1 \text{ mol KClO}_3}{122.5 \text{ g KClO}_3} \times \frac{3 \text{ mol O}_2}{2 \text{ mol KClO}_3} \times \frac{32 \text{ g O}_2}{1 \text{ mol O}_2} = 188.1 \text{ g O}_2$$

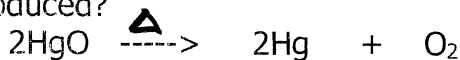
30. How many grams of sodium hydroxide will react with 150 grams of phosphoric acid?



$$150 \text{ g H}_3\text{PO}_4 \times \frac{1 \text{ mol H}_3\text{PO}_4}{98 \text{ g H}_3\text{PO}_4} \times \frac{3 \text{ mol NaOH}}{1 \text{ mol H}_3\text{PO}_4} \times \frac{40 \text{ g NaOH}}{1 \text{ mol NaOH}} = 183.7 \text{ g NaOH}$$

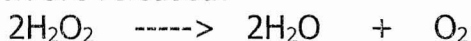
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31. If 120 grams of mercury II oxide are decomposed by heat, what volume of oxygen is produced?



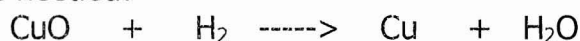
$$120 \text{ g HgO} \times \frac{1 \text{ mol HgO}}{217 \text{ g HgO}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol HgO}} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 6.2 \text{ L O}_2$$

32. When 70 grams of hydrogen peroxide are decomposed by light, how many liters of oxygen are released?



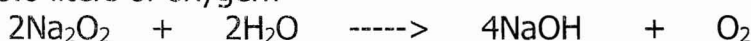
$$70 \text{ g H}_2\text{O}_2 \times \frac{1 \text{ mol H}_2\text{O}_2}{34 \text{ g H}_2\text{O}_2} \times \frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}_2} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 23.0 \text{ L O}_2$$

33. In the reduction of 100.0 grams of copper II oxide, how many liters of hydrogen are needed?



$$100.0 \text{ g CuO} \times \frac{1 \text{ mol CuO}}{79.5 \text{ g CuO}} \times \frac{1 \text{ mol H}_2}{1 \text{ mol CuO}} \times \frac{22.4 \text{ L H}_2}{1 \text{ mol H}_2} = 28.2 \text{ L H}_2$$

34. How many grams of dihydrogen monoxide must react with sodium peroxide to produce 75.0 liters of oxygen?



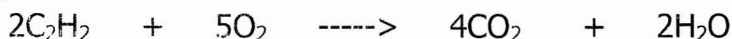
$$75.0 \text{ L O}_2 \times \frac{1 \text{ mol O}_2}{22.4 \text{ L O}_2} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol O}_2} \times \frac{18 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = 120.4 \text{ g H}_2\text{O}$$

35. In the Haber process for making ammonia, how many liters of ammonia gas are produced when 4600 liters of nitrogen gas is used?



$$4600 \text{ L N}_2 \times \frac{1 \text{ mol N}_2}{22.4 \text{ L N}_2} \times \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \times \frac{22.4 \text{ L NH}_3}{1 \text{ mol NH}_3} = 9200 \text{ L NH}_3$$

36. How many liters of oxygen are required to completely burn 800 liters of acetylene gas?

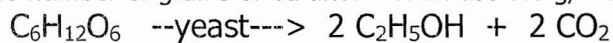


$$800 \text{ L C}_2\text{H}_2 \times \frac{1 \text{ mol C}_2\text{H}_2}{22.4 \text{ L C}_2\text{H}_2} \times \frac{5 \text{ mol O}_2}{2 \text{ mol C}_2\text{H}_2} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 2000 \text{ L O}_2$$

$$44977.8 \text{ g EtOH} \times \frac{1 \text{ mL EtOH}}{0.8 \text{ g EtOH}} = 56222.2 \text{ mL}$$

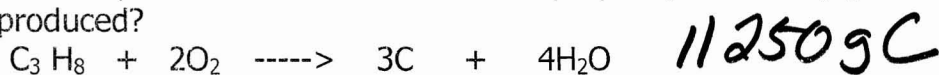
37. In the fermentation process, glucose can be converted to ethanol. How many milliliters of ethanol will be produced if 88000 gm of glucose are fermented?

(HINT: 1. find the number of grams of ethanol 2 Then use 0.8 g/mL to convert grams to mL.)



$$88000 \text{ g glucose} \times \frac{1 \text{ mol glucose}}{180 \text{ g glucose}} \times \frac{2 \text{ mol EtOH}}{1 \text{ mol glucose}} \times \frac{46 \text{ g EtOH}}{1 \text{ mol EtOH}} = 44977.8 \text{ g EtOH}$$

38. During the incomplete combustion of 7000 L of propane, how many grams of soot (C) are produced?



$$7000 \text{ L C}_3\text{H}_8 \times \frac{1 \text{ mol C}_3\text{H}_8}{201 \text{ g C}_3\text{H}_8} \times \frac{3 \text{ mol C}}{1 \text{ mol C}_3\text{H}_8} \times \frac{12.0 \text{ g C}}{1 \text{ mol C}} = 11250 \text{ g C}$$

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